

extremes from 18° at Key West, Florida, and 19° at Fort Macon, North Carolina, and Galveston, Texas, to 59° at Cœur d'Alene, Idaho, Fort Thornburg, Utah, and Phoenix, Arizona, and to 60° at Fort Bidwell, California, and Wickenburg, Arizona.

The following stations report monthly ranges of 50° or more: Fort Custer and Poplar River, Montana, and San Carlos, Arizona, 50°; Fort Thomas, Arizona, and Fort Benton, Montana, 51°; Dayton, Washington Territory, and West Las Animas, Colorado, 52°; Fort McDowell, Arizona, 54°; Willcox, and Forts Apache, and Verde, Arizona, 55°; Bismarck, Dakota, 57°; Fort Buford, Dakota, and Fort Bridger, Wyoming, 58°; Cœur d'Alene, Idaho, Fort Thornburg, Utah, and Phoenix, Arizona, 59°; Fort Bidwell, California, and Wickenburg, Arizona, 60°.

Monthly ranges of 27° and less occurred at the following stations: Key West, Florida, 18°; Fort Macon, North Carolina, and Galveston, Texas, 19°; Brownsville, Texas, and Cedar Keys, Florida, 21°; Fort Canby, Washington Territory, Indianola, Texas, and Hatteras, North Carolina, 22°; Fort Smith, Arkansas, and New Orleans, Louisiana, 23°; Block Island, Rhode Island, 24°; Atlanta, Georgia, and Cairo, Illinois, 25°; Pike's Peak, Colorado, Charleston, South Carolina, and Mobile, Alabama, 26°; Cape May, New Jersey, Jacksonville, Florida, Point Judith, Rhode Island, and Wilmington, North Carolina, 27°.

#### GREATEST DAILY RANGES OF TEMPERATURE.

The greatest daily ranges of temperature varied in the several districts as follows:

*New England.*—From 16° at Block Island, Rhode Island, on the 3d and 16th, to 29° at Eastport, Maine, on the 3d.

*Middle Atlantic states.*—From 19° at Delaware Breakwater, Delaware, on the 22d, to 30° at Washington City, District of Columbia, on the same date.

*South Atlantic states.*—From 15° at Fort Macon and Hatteras, North Carolina, on the 7th and 10th, respectively, to 25° at Kitty Hawk, North Carolina, on the 25th.

*Florida peninsula.*—From 15° at Key West on the 26th, to 19° at Cedar Keys on the 6th.

*East Gulf states.*—From 19° at New Orleans, Louisiana, on the 26th, to 26° at Vicksburg, Mississippi, on the 12th.

*West Gulf states.*—From 15° at Galveston, Texas, on the 10th to 35° at Fort Smith, Arkansas, on the 11th.

*Rio Grande valley.*—From 21° at Brownsville, Texas, on the 21st, to 34° at Rio Grande City, Texas, on the same date.

*Tennessee.*—From 24° at Nashville, on the 22d, to 27° at Knoxville, on the same date.

*Ohio valley.*—From 23° at Cincinnati, Ohio, on the 22d, to 37° at Pittsburg, Pennsylvania, on the same date.

*Lower lake region.*—From 24° at Rochester, New York, Erie, Pennsylvania, Toledo, Ohio, and Oswego, New York, on the 1st, 11th, 22d, and 30th, respectively, to 37° at Sandusky, Ohio, on the 22d.

*Upper lake region.*—From 19° at Grand Haven, Michigan, on the 18th, to 29° at Escanaba, Michigan, on the 20th.

*Extreme northwest.*—From 31° at Moorhead and Saint Vincent, Minnesota, on the 9th and 19th, respectively, to 40° at Fort Buford, Dakota, on the 9th.

*Upper Mississippi valley.*—From 22° at Cairo, Illinois, and Saint Louis, Missouri, on the 5th and 12th, respectively, to 30° at Dubuque, Iowa, on the 10th.

*Missouri valley.*—From 29° at Omaha, Nebraska, and Yaukton, Dakota, on the 10th and 21st, respectively, to 38° at Fort Bennett, Dakota, on the 25th.

*Northern slope.*—From 30° at Deadwood, Dakota, on the 9th, to 47° at Forts Benton and Shaw, Montana, on the 5th.

*Middle slope.*—From 21° on the summit of Pike's Peak, Colorado, on the 26th, and 22° at Dodge City, Kansas, on the 6th, to 46° at West Las Animas, Colorado, on the 4th.

*Southern slope.*—From 37° at Fort Sill, Indian Territory, and Fort Concho, Texas, on the 11th, to 38° at Fort Stockton, Texas, on the 30th.

*Southern plateau.*—From 27° at Fort Grant, Arizona, on the 4th, to 49° at Fort Apache, Arizona, on the 26th.

*Middle plateau.*—32° at Salt Lake City, Utah on the 5th.

*Northern plateau.*—From 33° at Boise City, Idaho, on the 27th, to 40° at Dayton, Washington Territory, on the 25th.

*North Pacific coast region.*—From 18° at Fort Canby, Washington Territory, on the 26th, to 35° at Roseburg, Oregon, and Olympia, Washington Territory, on the 8th and 13th, respectively.

*Middle Pacific coast region.*—From 24° at San Francisco, California, on the 10th, to 38° at Red Bluff, California, on the 31st.

*South Pacific coast region.*—From 21° at San Diego, California, on the 10th, to 42° at Los Angeles, California, on the 1st.

#### FROSTS.

Frosts occurred during July, as follows:

*California.*—Blue Lake, 7th.

*Colorado.*—On the summit of Pike's Peak, 20th, 25th, 26th.

*Dakota.*—Fort Totten, 1st, 12th.

*Montana.*—Fort Maginnis: reports from Maidenville state that ice formed to a thickness of one-eighth inch, and that a killing frost occurred at that place on the 5th. Maidenville is five miles distant from, and its altitude about eight hundred feet above Fort Maginnis.

*Nevada.*—Carson City, 4th, 16th, 18th, 19th, 20th.

*New Hampshire.*—Dover: a heavy frost occurred in Latham during the night of the 25–26th, which seriously injured the crops.

*Petersborough:* there was considerable frost in the low lands on the morning of the 26th, which caused injury to beans and other vegetables.

Frosts occurred on the summit of Mount Washington on the 25th, 26th, and 29th.

*Pennsylvania.*—Troy, 8th, 17th; Wellsborough, 15th.

*Vermont.*—Woodstock, 26th.

The following extract is from the "Canadian Weather Review" for July, 1884:

Sharp frosts are reported from the eastern part of Ontario, at Ennismore, on the 21st; at L'Amable and Denbigh on the 25th; and at Shoal Lake, Manitoba, potatoes are reported to have been cut down by frost on the 1st.

#### PRECIPITATION.

[Expressed in inches and hundredths.]

The distribution of rainfall over the United States and Canada, as determined by the reports from nearly eight hundred stations, is exhibited on chart iii.

A comparison of the precipitation for July 1884, with the average for the corresponding month for a series of years shows deficiencies in the following districts: upper lake region, Ohio valley, western Tennessee, and, with the exception of a few localities, in all of the southern districts. From Arizona eastward to the Mississippi river the deficiencies at numerous stations exceeded three inches, and owing to the unusually small precipitation in those districts, severe drought prevailed. While the average precipitation for the east Gulf states, as shown in the table, is about normal, it was unevenly distributed, being deficient over Alabama and Georgia and excessive in the vicinities of Pensacola, Florida; Vicksburg, Mississippi; and Chattanooga, Tennessee. The precipitation for July, 1884, exceeded the average in the following districts: eastern Tennessee; in the Atlantic coast states north of South Carolina; in the Arkansas and Missouri valleys; central and western Montana; central and southern Illinois; central Indiana; northeastern Ohio; and in western New York. The excess was greatest in the lower Missouri valley; New England; the middle Atlantic states; and in western Montana. On the summit of Mount Washington, New Hampshire, the precipitation for the month was 23.90, which is an excess of 14.08 over the average for July, and is the largest amount recorded in any month since observations were begun in September, 1871; the next largest being 23.41 for April, 1878.

The first column of the following table shows the average precipitation for the month of July in each of the various districts, as determined from Signal Service observations for a

series of years; in the second column are given the averages for July, 1884; and the third column shows the excess or deficiency of July, 1884, when compared with the average.

*Average precipitation for July, 1884.*

Districts.	Average for July, 1884.		Comparison of July, 1884, with the average for several years.
	For several years.	For 1884.	
	Inches.	Inches.	Inches.
New England.....	4.13	5.74	1.61 excess.
Middle Atlantic states.....	4.10	5.44	1.34 excess.
South Atlantic states.....	5.77	6.73	0.96 excess.
Florida peninsula.....	0.18	4.80	1.38 deficiency.
Eastern Gulf states.....	4.82	4.80	0.02 deficiency.
Western Gulf states.....	4.00	2.71	1.29 deficiency.
Rio Grande valley.....	2.25	0.11	2.14 deficiency.
Tennessee.....	3.92	4.71	0.79 excess.
Ohio valley.....	4.50	4.21	0.29 deficiency.
Lower lake region.....	3.55	3.93	0.38 excess.
Upper lake region.....	3.31	2.90	0.41 deficiency.
Extreme northwest.....	3.02	3.55	0.53 excess.
Upper Mississippi valley.....	4.06	4.51	0.45 excess.
Missouri valley.....	4.25	6.24	1.99 excess.
Northern slope.....	1.49	3.24	1.75 excess.
Middle slope.....	2.53	2.46	0.07 deficiency.
Southern slope.....	3.00	0.87	2.13 deficiency.
Southern plateau.....	2.42	0.34	2.08 deficiency.
Northern plateau.....	0.81	0.83	0.02 excess.
North Pacific coast region.....	0.09	0.82	0.73 excess.
Middle Pacific coast region.....	0.01	0.00	0.01 deficiency.
South Pacific coast region.....	0.08	0.01	0.07 deficiency.
Mount Washington, N. H.....	9.82	23.90	14.08 excess.
Pike's Peak, Colo.....	4.64	0.41	4.23 deficiency.
Salt Lake City, Utah.....	0.62	0.27	0.35 deficiency.

**DEVIATIONS FROM AVERAGE PRECIPITATION.**

The departures exhibited by the reports from the regular Signal Service stations are shown in the table of average precipitation for July, 1884. Voluntary observers report the following notes in connection with this subject:

**Arkansas.**—Lead Hill, Boone county: monthly precipitation, 5.04, is 4.96 below the July average for the two preceding years.

**Connecticut.**—Hartford, Hartford county: monthly precipitation, 5.98, is 0.98 in excess of the average for July.

**Dakota.**—Webster, Day county: monthly precipitation, 14.65, is unusually excessive, being 9.39 above the average for July for the two preceding years.

**Illinois.**—Mattoon, Coles county: monthly precipitation, 3.65, is 1.10 in excess of the average for the four preceding years.

Anua, Union county: monthly precipitation, 5.49, is 1.29 above the July average for the last nine years.

Riley, McHenry county: monthly precipitation, 4.19, is 0.16 above the July average of the last twenty-three years.

Swanwick, Perry county: monthly precipitation, 1.90, is 1.51 below the July average for the three preceding years.

**Indiana.**—Vevay, Switzerland county: monthly precipitation, 3.41, is 0.74 below the July average of the last twenty years.

Logansport, Cass county: monthly precipitation, 3.17, is 1.11 below the July average for the last twenty-five years.

Wabash, Wabash county, monthly precipitation, 4.79, is 1.59 above the July average for the last eight years.

**Kansas.**—Independence, Montgomery county: monthly precipitation, 5.77, is 1.46 above the July average for the last twelve years.

Yates Centre, Woodson county: monthly precipitation, 2.85, is 0.66 below the July average for the four preceding years.

Wellington, Sumner county: monthly precipitation, 1.89, is 1.98 below the July average for the last six years.

Fort Scott, Bourbon county: monthly precipitation, 10.76, is the largest amount that has fallen in any one month since August, 1880.

**Maine.**—Gardiner, Kennebec county: monthly precipitation, 5.17, is 1.76 in excess of the July average for a period of forty-eight years.

**Maryland.**—Fallston, Harford county: monthly precipitation, 3.57, is 0.09 below the July average for the last thirteen years.

*Table of excessive and greatest monthly precipitation—July, 1884.*

Station.	Specially heavy.		Largest monthly.	Amount.	Station.	Specially heavy.		Largest monthly.	Amount.
	Date.	Amt.				Date.	Amt.		
<b>Alabama.</b>					<b>Maine.</b>				
Green Springs.....	10	2.26	12.02		Eastport.....	9	2.40	8.48	
Do.....	25	2.17			Portland.....	9, 10	3.46	6.78	
Tuscaloosa.....	9	2.50	10.48		<b>Maryland.</b>				
Do.....	28	2.95			Baltimore.....	11	3.75	9.43	
Greensborough.....	27, 28	2.86	9.60		Fort McHenry.....	11	3.54	7.60	
Clanton.....	10, 11	3.75	9.00		Ocean City.....	29	2.03	6.30	
Do.....	25, 26	2.50			McDonough.....	2	2.45		
Fayette.....	29	2.25			Cumberland.....	28	2.23		
Marion.....	31	3.50	8.25		<b>Michigan.</b>				
Scottsborough.....	28	3.10	8.19		Traverse City.....	3	2.10		
Evergreen.....	14, 15, 16	2.61	7.74		Grand Haven.....	23	2.28		
Dadeville.....	14, 15	2.38	7.53		<b>Minnesota.</b>				
Do.....	27, 28	2.35	7.53		Moorhead.....	3, 4	3.58	7.32	
Selma.....	28, 29	2.28	7.21		<b>Mississippi.</b>				
Enfauila.....	28, 29	3.03	6.63		Columbus.....	28	4.30	10.20	
Wetumpka.....	27, 28	5.00	6.50		Waynesborough.....	18	2.15	6.98	
Decatur.....	28	2.58	6.47		Vicksburg.....	3	1.95		
Tusculum.....	30, 31	2.16	6.11		Do.....	18	1.86		
Carrollton.....	28	3.50			Aberdeen.....	28	2.99		
Birmingham.....	25	2.47			Holly Springs.....	28	2.00		
Trinity.....	27	2.20			Edwards.....	18	2.20		
Troy.....	14	2.00			Hernando.....	28	2.50		
<b>Arkansas.</b>					<b>Missouri.</b>				
Mount Ida.....	27, 28	2.75			Miami.....			14.17	
Fort Smith.....	27, 28	2.70			Glacgow.....			10.95	
Lead Hill.....	15, 16	2.43			Springfield.....	19	2.30	9.22	
<b>Connecticut.</b>					Do.....	27	3.10		
Bethel.....			7.16		Dresden.....			7.37	
Voluntown.....			6.40		Lexington.....			7.26	
New London.....			6.02		Fronton.....			7.00	
New Haven.....	19	2.08			Sedalia.....			6.93	
Hartford.....	28, 29	2.02			Mexico.....			6.75	
<b>Dakota.</b>					Greenfield.....			6.60	
Webster.....	3	5.94	14.65		Oregon.....			6.35	
Do.....	14	2.08			Bonville.....			6.31	
Do.....	24, 25	2.70			Conception.....	12, 13	2.05	6.12	
<b>District of Columbia.</b>					<b>Montana.</b>				
Distributing Reservoir.....	29, 30	3.08	8.63		Fort Assinaboine.....	16	3.27	9.67	
Washington City.....	1	2.05	7.39		Do.....	24	1.53		
Do.....	27, 28, 29	2.07	6.30		<b>Nebraska.</b>				
West Washington.....					Ashland.....			11.79	
<b>Florida.</b>					Minden.....			11.60	
Fort Barrancas.....	16	7.30	11.80		Omaha.....	16, 17, 18	5.28	10.35	
Pensacola.....	6	1.71	8.79		Fairburg.....			9.47	
Do.....	10	2.23			Fremont.....	18	2.40	9.03	
Archer.....	22	2.37	8.33		Do.....	24	2.21		
Jacksonville.....	16	2.05	6.02		Do.....	2, 3	2.70	9.03	
Cedar Keys.....	1, 2	3.03	6.02		Central City.....			9.00	
<b>Georgia.</b>					De Witt.....			8.70	
Smithville.....	12	7.50	11.85		Marquette.....	21	2.70	8.25	
Albany.....	11	2.43	8.57		De Soto.....	23, 24	2.00	7.87	
Athens.....	4	4.02	7.02		Superior.....			7.87	
Dalton.....	14	2.41	6.51		York.....			7.87	
Americus.....			6.25		Weeping Water.....			7.62	
Alapaha.....	11	2.27	6.23		Rush.....			7.43	
<b>Illinois.</b>					Gena.....	24	2.20	7.30	
Prairieville.....	8	2.00	10.60		West Point.....			7.18	
Do.....	23	2.00			Red Willow.....	13	2.50	7.04	
Do.....	30	2.43			Falls City.....			7.01	
Sycamore.....	23, 24, 25	4.05	8.84		Table Rock.....			6.78	
Do.....	5	2.16	7.34		Keene.....			6.60	
Do.....	30, 31	2.14			Beaver Creek.....			6.34	
Sandwich.....	8, 9	2.68	7.06		<b>New Hampshire.</b>				
Greenville.....			6.82		Mt. Washington.....	9, 10	3.19	23.90	
Polo.....	8	2.35	6.39		Do.....	14 to 17	10.55		
Ansonia.....			6.33		Do.....	19, 20, 21	4.12		
Rockford.....			6.13		Do.....	23, 24	2.41		
<b>Indiana.</b>					Weir's Bridge.....	23	2.04		
Marengo.....			8.60		<b>New Jersey.</b>				
Clinton.....	24, 25	3.20	7.91		Caldwell.....	4, 5	2.18	6.62	
Worthington.....			7.87		Puterson.....	5	2.30	6.46	
Fillmore.....			7.11		Sandy Hook.....	4, 5	2.00	6.42	
Terre Haute.....	8, 9	2.08	7.11		Belvidere.....	4, 5	3.42	6.12	
Indianapolis.....			6.03		Phillipsburg.....	4, 5	2.63		
Fort Wayne.....	30, 31	2.15			Readington.....	5	2.50		
<b>Iowa.</b>					Atlantic City.....	29	2.21		
Logan.....	24	2.40	7.40		<b>New York.</b>				
Des Moines.....	23, 24	2.23	7.16		West Point.....			8.40	
Independence.....	29	4.05	6.60		Mountainville.....	4, 5	2.20	7.72	
Dubuque.....	23	2.15			White Plains.....	4, 5	3.05	7.05	
Ottumwa.....	24	2.06			Fort Columbus.....	13, 14	2.20	7.30	
<b>Kansas.</b>					Madison Barr'ks.....	4, 5	2.40		
Fort Scott.....	17	4.15	10.76		New York City.....	12, 13	2.15		
W. Leavenworth.....	13, 14	3.10	9.50		<b>North Carolina.</b>				
Do.....	30	1.80			Kitty Hawk.....	6, 7	2.80	10.76	
Leavenworth.....	12, 13	4.30	9.43		Do.....	11	2.83		
Do.....	30, 31	3.18			Hatteras.....	11	4.16	10.51	
Westmoreland.....	13, 14	2.75	8.50		Wilmington.....	19	1.57	8.29	
Elk Falls.....			7.50		Do.....	1, 2	2.92	7.97	
Allison.....	15	2.21	6.04		Do.....	3	2.09		
Dodge City.....	9	2.05	6.40		Wadesborough.....	11	3.05	7.93	
Do.....	16	2.13			Charlotte.....	11	3.10	7.90	
Manhattan.....	14	2.45	6.33		Smithville.....	11	5.60	7.32	
Atchison.....	12, 13	3.20			Chapel Hill.....	26	2.02	6.63	
Wandolte.....	13	2.35			<b>North Carolina.</b>				
Salina.....	15	3.02			Sidney.....			9.17	
Sterling.....	17	2.13			Halifax.....			8.29	
<b>Kentucky.</b>					<b>Ohio.</b>				
Richmond.....	25	2.07	6.35		Junction.....			6.60	
					Warren.....			6.29	
					Garrettsville.....	29	2.43		
					Toledo.....	30, 31	2.05		
					Waukegan.....	30, 31	2.85		

Table of excessive and greatest monthly precipitation—Cont'd—July, 1884.

Station.	Specially heavy.		Largest monthly amount.	Station.	Specially heavy.		Largest monthly amount.
	Date.	Amt.			Date.	Amt.	
<i>Ohio.</i> —Cont'd.				<i>Tenn.</i> —Cont'd.			
Cleveland.....	27	2.02		Hardison's Mills.....	28, 29	3.18	8.27
<i>Pennsylvania.</i>				Howell.....	30, 31	2.01	7.82
Wellsborough.....	25	2.95	8.67	Xenophon.....	7	2.30	7.00
Blooming Grove.....	27, 28	2.10	8.50	Do.....	23, 24	4.14	
Quakertown.....			7.92	Beach Grove.....	27, 28	2.42	7.54
Leetsdale.....	1	2.03	7.01	Henderson.....	26, 27	2.10	7.45
Do.....	29	2.00		Ashwood.....	7	2.30	7.00
Tamaqua.....			6.06	Hohenwald.....			0.83
Drifton.....			6.77	Centerville.....			0.74
Dyberry.....			6.02	Flat Creek.....			0.55
Chambersburg.....	4	3.28		Savannah.....	25, 26	2.41	0.27
Philadelphia.....	5, 6	2.52		Kingston.....	31	3.30	0.26
Haverford College.....	5, 6	3.35		Hurricane Switch.....			0.26
<i>Quebec.</i>				Maryville.....	31	2.28	0.22
Quebec.....			6.70	Smithville.....			0.20
<i>Rhode Island.</i>				Dyersburg.....			0.12
Narragansett Pier.....	9	1.95	6.68	Ridgely.....			0.11
Block Island.....	27	1.84	6.52	Union City.....	5	2.59	
<i>South Carolina.</i>				Farmington.....	31	2.54	
Jacksborough.....	12	2.55	11.28	<i>Texas.</i>			
Do.....	3, 4, 5	4.10		Fort Concho.....	17, 18	2.25	
Florence.....	4	2.58	9.61	<i>Virginia.</i>			
Charleston.....	11, 12	4.34	9.52	Accotink.....	21, 25	2.60	8.13
Saint George's.....	15	3.07	8.52	Do.....	28, 29	2.08	
Chester.....	11	2.10	8.34	Cape Henry.....	6	1.89	7.61
Do.....	11	3.03		Norfolk.....	11	2.04	7.06
Greenville.....	10, 11	2.28	7.25	Do.....			
Yemassee.....	12	2.60	6.88	<i>Wisconsin.</i>			
Allendale.....	19	2.30		Madison.....	3	2.10	8.44
<i>Tennessee.</i>				Do.....	23, 24	3.79	
Manchester.....	3	2.44	10.62	Embaras.....	23, 24	2.50	6.25
Do.....	27, 28	3.72		Nellisville.....	23	3.99	6.05
Knoxville.....	26, 27	2.01	8.90	Manitowoc.....	22	3.32	
Estill.....	25	2.30	8.07	Lancaster.....	23	2.79	
Milan.....	25	2.43	8.51	Sussex.....	23	2.10	
Do.....	25, 26	3.23		Franklin.....	24, 25	2.95	

*Massachusetts.*—Worcester, Worcester county: monthly precipitation, 4.07, is 0.51 in excess of the average for a period of forty-two years. The largest July precipitation occurring during the above period is 9.40 for July, 1855; the smallest, 0.43 for July, 1873.

*Missouri.*—Saint Louis: monthly precipitation, 2.94, is 1.22 below the July average for a period of forty-seven years.

*New Hampshire.*—Contoocook, Merrimack county: monthly precipitation, 2.00, is exactly one-half of the average amount for July at this place.

*New Jersey.*—Paterson, Passaic county: monthly precipitation, 6.46, is 2.18 in excess of the average for July.

South Orange, Essex county: monthly precipitation, 5.05, is 0.51 above the July average for the last fourteen years.

*New York.*—Palermo, Oswego county: monthly precipitation, 1.62, is 2.60 below the July average for the last thirty-one years.

North Volney, Oswego county: monthly precipitation, 2.50, is 1.12 below the July average of the last thirteen years.

*Ohio.*—Wauseon, Fulton county: monthly precipitation, 4.20, is 0.24 below the July average of the last twelve years.

*Pennsylvania.*—Dyberry, Wayne county: monthly precipitation, 6.02, is 0.93 above the July average of the last thirteen years.

*Texas.*—New Ulm, Austin county: no rain fell at this station during the entire month; the average July precipitation for the last thirteen years is 4.59. The present July is the first month, during the past thirteen years, in which no rain has fallen.

*Vermont.*—Woodstock, Windsor county: monthly precipitation, 2.36, is 1.65 below the July average for the last sixteen years.

*Virginia.*—Wytheville, Wythe county: monthly precipitation, 2.76, is 1.29 below the July normal.

Variety Mills, Nelson county: monthly precipitation, 3.96, is 0.79 above the July average for the last six years.

*West Virginia.*—Helvetia, Randolph county: monthly precipitation, 5.12, is 2.22 below the July average for the last eight years.

#### HAIL.

*Dakota.*—Plankinton, Aurora county: a destructive hail storm occurred at about 6 a. m. of the 11th; all windows on

the north side of buildings were broken. The storm started at a point about twelve miles northwest of Plankinton, and passed southeastward for a distance of about thirty miles. Nearly all of the grain in the storm's path was completely destroyed, many farmers losing their entire crops.

Huron: a destructive storm occurred in this vicinity between 1 and 2 p. m. of the 21st. The course of the storm was from northwest to southeast, its path being about eight miles in width near Huron, and increasing to about twice that width at Carthage, twenty-five miles distant. In the vicinity of Carthage the hail stones were of remarkable size and fell with a force sufficient to penetrate the roofs of buildings and to break ordinary weather boarding.

On the 23d a hail storm occurred in Hand, Spink, and Sully counties, which totally destroyed the crops, entailing losses estimated at \$50,000.

On the 25th a destructive hail storm occurred about thirty miles northwest of Huron, the track of the storm being one and one-half miles in width. Several small buildings and all of the standing grain in the storm's path were destroyed.

Fargo, Cass county: reports from Tower City, in this county, state that a destructive hailstorm occurred at 4 p. m. of the 25th. Several buildings were unroofed or blown down; about 1,000 window panes were broken. The crops in the vicinity of Tower City were ruined.

Grandin, Traill county: a heavy hail storm occurred in this vicinity on the 31st, ruining the crops and causing damage to buildings. This storm passed north of Glyndon where it was also very destructive.

Iowa.—Des Moines: reports from Webster City, Hamilton county, state that on the 11th a destructive hail storm occurred in that county. There were two storm clouds, one approached from the north-northwest, and the other from the northeast, which, after uniting, moved to the eastward. About one hundred farms in the townships of Cass, Blairsburg, Liberty and Rose Grove, suffered to a more or less extent, the total loss aggregating from \$75,000 to \$125,000. The report states that no storm of equal severity has ever been known in Hamilton county. The hailstones were small on the outer edge of the storm, but near the centre they were half the size of hens' eggs. The storm lasted from five to ten minutes, leaving the ground covered with hailstones to a depth of from three to six inches. All windows on the north and east sides of buildings were broken.

*Kansas.*—Westmoreland, Pottawatomie county: from 6.30 to 7 p. m. of the 24th one of the severest hail storms prevailed that has been known in this county for many years. The hailstones were as large as hens' eggs and broke the glass in many windows. The growing crops were also badly damaged.

*Maine.*—Bangor: a severe hail storm passed a few miles north of this place on the 13th.

*Minnesota.*—Fergus Falls, Otter Tail county: a severe hail storm occurred about 3 p. m. on the 24th, which, in many places, totally destroyed the grain crop in this vicinity.

*Montana.*—Fort Assinaboine: on the 15th, a hail storm of unusual severity passed between Helena and Silver City. The track of the storm was about one mile wide, within which many birds and small animals were killed. The storm lasted for about twenty minutes.

*Nebraska.*—Omaha: a violent hailstorm occurred in Fillmore county on the 13th; the storm's path was about three miles in width and passed from west to east, the destruction being greatest near the centre of the storm; the hail stones were of a variety of sizes and shapes, and fell with such force that in some instances the roofs of buildings were reduced to splinters; many small animals were killed.

Fremont, Dodge county: violent hailstorms occurred in Merrick and York counties on the afternoon of the 20th. In the vicinity of Bradshaw, York county, over a strip of country five miles wide and about thirteen miles in length, the crops were entirely ruined, the hailstones being as large as hens' eggs. All but eight sections of the township of Brad-

shaw was visited by the storm and the losses sustained will aggregate about \$100,000.

Tecumseh, Johnson county: severe hail storms passed to the northeast and southwest of this place on the 30th; that passing to the eastward was about one half mile wide and six miles in length, and was very destructive to the growing crops. The path of the storm which passed to the southward was very narrow and about six miles in length; it was also destructive to crops.

New Hampshire.—Claremont, Sullivan county: one of the severest hail storms ever known in this region passed over Cornish on the afternoon of the 19th; it started on the east side of the Connecticut river near Windsor, Vermont, and extended northward to Plainfield, its path being from one-half mile to one mile in width. The hail-stones were as large as hens' eggs, and in some places accumulated to a depth of two feet. The damage is estimated at from \$4,000 to \$5,000.

New York.—Newburg, Orange county: a severe wind and hail storm occurred in this city on the afternoon of the 11th; the hail stones were of considerable size and caused serious injury to fruit.

Rochester: during a thunder-storm on the afternoon of the 12th a heavy fall of hail occurred in the western part of the city, the width of the hail-belt being about one-fourth of a mile. All kinds of vegetation was seriously injured, and much window-glass was destroyed; the hail stones were as large as walnuts.

Kingston, Ulster county: a severe hail storm occurred on the afternoon of the 19th; the ground was covered with hail stones, some of them measuring two inches in circumference. The damage to grape vines and fruit and to green-houses was very great.

Ohio.—Toledo: the steamer "Evening Star," from Erie to Toledo, when near the latter port, between 7 and 8 p. m. of the 30th, was caught in a severe hail squall.

Pennsylvania.—Erie: A hail storm occurred on the 12th at a point six miles east of Erie; the hail-stones were unusually large, and damaged the crops to a great extent.

Vermont.—Brattleborough, Windham county: a destructive hail storm occurred during the night of the 19-20th, which caused great damage to crops in various portions of this county.

Wisconsin.—Eau Claire, Eau Claire county: on the afternoon of the 25th a violent hail storm passed over the towns of Pleasant Valley, Clear Creek, and Otter Creek. Hogs, sheep, and cattle were killed by the hail stones, some of which weighed several ounces. The damage to crops is estimated at \$20,000.

Hail storms of less severity than those reported above, occurred in the various states and territories as follows:

Arizona.—Wickenburg, 15th.

Arkansas.—Mount Ida and Fort Smith, 27th.

California.—Blue Lake, 12th.

Colorado.—Denver, 21st; Pike's Peak, 12th, 15th, 21st, 29th.

Connecticut.—Bethel, 12th, 19th; Voluntown, 13th.

Dakota.—Deadwood, 18th, 25th; Fort Bennett, 1st, 25th; Fort Lincoln, 2d; Fort Sisseton, 25th; Fort Totten, 23d; Fort Yates, 1st, 2d, 28th; Huron, 21st, 23d, 25th.

Delaware.—Delaware Breakwater, 13th.

District of Columbia.—West Washington, 11th.

Georgia.—Augusta, 11th.

Illinois.—Edgington, 4th; Sycamore, 24th, 25th.

Indiana.—Wabash, 24th.

Indian Territory.—Cantonment, 29th.

Iowa.—Guttenberg, 23d; Independence, 29th; Manchester, 3d, 11th; Ottumwa, 21st.

Kansas.—Allison, 26th; Fort Scott, 4th, 27th; Salina, 1st; Sherlock, 26th; Topeka, 30th; Wellington, 15th.

Maryland.—Baltimore and Fort McHenry, 11th.

Massachusetts.—Fall River, 13th; Heath, 9th.

Michigan.—Escanaba, 11th.

Minnesota.—Duluth, 10th; Moorhead, 3d, 28th, 31st; Saint Vincent, 20th.

Mississippi.—Vicksburg, 31st.

Table of smallest monthly precipitation—July, 1884.

Station.	Amt.	Station.	Amt.
<i>Alabama.</i>		<i>California,—Continued.</i>	
Fort Deposit	0.41	Petaluma	0.00
<i>Arizona.</i>		Bishop Creek	0.00
Casa Grande	0.00	Keeler	0.00
Yuma	0.00	Pinetown	0.00
Phoenix	0.07	San Diego	0.00
Fort McDowell	0.08	San Francisco	trace
Fort Apache	0.14	Los Angeles	0.02
Fort Verde	0.19	Hydesville	0.05
Wickenburg	0.28	Blue Lake	0.24
Fort Thomas	0.35	Cape Mendocino	0.45
San Carlos	0.37	<i>Colorado.</i>	
Pantano	0.40	Pike's Peak	0.41
Maricopa	0.53	Denver	0.05
Tucson	0.65	Pueblo	0.72
Fort Bowie	0.65	<i>Idaho.</i>	
Fort Grant	0.67	Boise City	0.60
Benoni	0.70	<i>Indian Territory.</i>	
<i>Arkansas.</i>		Fort Sill	0.23
Prescott	0.72	<i>Louisiana.</i>	
Texarkana	0.98	Natchitoches	0.00
<i>California.</i>		Shreveport	0.06
Oakland	0.00	<i>Mississippi.</i>	
Niles	0.00	Meridian	0.03
Pleasanton	0.00	Hazlehurst	0.14
Livermore	0.00	Jackson	0.20
Tracy	0.00	Brookhaven	0.48
Lathrop	0.00	Natchez	0.62
Stockton	0.00	Okolona	0.69
Galt	0.00	<i>Montana.</i>	
Brighton	0.00	Fort Maginnis	0.64
Sacramento	0.00	Fort Custer	0.80
Rocklin	0.00	<i>Nebraska.</i>	
Anuburn	0.00	Reno	0.00
Colfax	0.00	Humboldt	0.00
Alta	0.00	Goldconda	0.00
Emigrant Gap	0.00	Battle Mountain	0.00
Cisco	0.00	Beowawe	0.00
Summit	0.00	Elko	0.00
Truckee	0.00	Wells	0.00
Boon	0.00	Toano	0.00
Marysville	0.00	Hawthorne	0.00
Chico	0.00	Carson City	0.00
Tehama	0.00	Halleck	0.03
Red Bluff	0.00	Otoe	0.04
Redding	0.00	Hot Springs	0.04
Modesto	0.00	Palisade	0.05
Turlock	0.00	Carlin	0.07
Morced	0.00	Torona	0.10
Borden	0.00	Brown's	0.15
Fresno	0.00	<i>New Mexico.</i>	
Kingsburg	0.00	Fort Craig	0.42
Martinez	0.00	Deming	0.52
Dunnigan	0.00	Fort Union	0.70
Williams	0.00	<i>Oregon.</i>	
Willows	0.00	Roseburg	0.05
Orland	0.00	Klamath Agency	0.24
Antioch	0.00	Umatilla	0.32
Brentwood	0.00	Lakeview	0.50
Byron	0.00	<i>Texas.</i>	
South Vallejo	0.00	Dallas	0.00
Suisun	0.00	Cuero	0.00
Davis	0.00	Hearne	0.00
Napa	0.00	Huntsville	0.00
Calistoga	0.00	San Antonio	0.00
Woodland	0.00	Tyler	0.00
Knight's Landing	0.00	Rio Grande City	0.00
San Mateo	0.00	New Ulm	0.00
Menlo Park	0.00	El Paso	0.00
San José	0.00	Hempstead	0.01
Tonant	0.00	Longview	0.03
Gilroy	0.00	Palestine	0.00
Hollister	0.00	Waco	0.00
Pajaro	0.00	Fort Brown	0.08
Salinas City	0.00	Clarksville	0.12
Chualar	0.00	Brownsville	0.23
Soledad	0.00	Columbia	0.30
Monterey	0.00	Cleburne	0.32
Santa Cruz	0.00	Indianola	0.33
Aptos	0.00	Fort Davis	0.35
College City	0.00	Belton	0.42
Soquel	0.00	Paris	0.48
Goshen	0.00	Fort Stockton	0.52
Tulare	0.00	Sour Lake	0.94
Delano	0.00	<i>Utah.</i>	
Summer	0.00	Ogden	0.00
Caliente	0.00	Promontory	0.00
Keene	0.00	Blue Creek	0.00
Tehichapi	0.00	Terrace	0.03
Mojave	0.00	Kelton	0.15
Ravenna	0.00	Fort Thornburg	0.10
Newhall	0.00	Corinne	0.20
San Fernando	0.00	Nephi	0.25
Spadra	0.00	Salt Lake City	0.27
Colton	0.00	<i>Washington Territory.</i>	
White Water	0.00	Bainbridge Island	0.10
Indio	0.00	Ainsworth	0.23
Mammoth Tank	0.00	Dayton	0.32
Baggett	0.00	Olympia	0.60
Fenner	0.00	Fort Spokane	0.82
Needles	0.00	<i>Wyoming.</i>	
Lone	0.00	Fort Fred Steele	0.14
Farmington	0.00	Fort Bridger	0.21
Lemoore	0.00	Cheyenne	0.60
Anahelm	0.00		

Montana.—Fort Assinaboine, 7th, 11th; Fort Custer, 22d.

**Nebraska.**—De Soto, 23d; Fremont, 18th; Marquette, 21st, 24th, 27th, 29th; North Platte, 10th, 18th; Stockham, 27th.  
**New Hampshire.**—Mount Washington, 13th.  
**New Jersey.**—Readington, 12th; South Orange, 19th.  
**New York.**—Albany and Humphrey, 12th; Ithaca and Mountville, 13th.  
**Ohio.**—Jacksonborough, 24th.  
**Pennsylvania.**—Catawissa, 31st; Drifton, 11th; Fallsington, 5th; Philadelphia, 5th.  
**Tennessee.**—Ashwood, 9th; Milan, 30th.  
**Texas.**—Fort Stockton, 24th.  
**Utah.**—Salt Lake City, 12th.  
**Vermont.**—Strafford and Woodstock, 19th.  
**Virginia.**—Chincoteague, 24th; Fort Myer, 11th.  
**Wisconsin.**—Embarras, Neillsville and Wausau, 22d; La Crosse, 25th; Sussex, 23d.

## SNOW.

The observer on the summit of Mount Washington, New Hampshire, reports that a light flurry of snow occurred at that station during the early morning of the 21st.

On the summit of Pike's Peak, Colorado, snow is reported to have fallen on the following dates: 11th, 23d, 24th, 28th and 29th.  
*Table of rainy and cloudy days, relative humidity, and dew-point for July, 1884.*

Districts.	Rainy days.	Cloudy days.	Rel. humidity, %	Dew-point.
			<i>Percentages.</i>	
New England.....	From 12 to 18	From 5 to 11	From 71.9 to 84.6	From 53.1 to 61.0
Middle Atlantic states.....	" 10 " 18	" 4 " 10	" 64.4 " 83.7	" 57.4 " 68.2
South Atlantic states.....	" 9 " 17	" 3 " 14	" 71.2 " 83.8	" 65.0 " 74.0
Florida peninsula.....	" 7 " 16	" 2 " 7	" 71.2 " 75.9	" 73.6 " 74.4
East Gulf states.....	" 8 " 19	" 1 " 4	" 69.7 " 81.0	" 71.8 " 73.8
West Gulf states.....	" 2 " 9	" 0 " 3	" 67.1 " 80.8	" 71.4 " 76.6
Rio Grande valley.....	" 0 " 3	" 0 " 0	" 56.9 " 78.0	" 68.0 " 74.4
Ohio valley.....	" 8 " 15	" 5 " 9	" 60.0 " 73.2	" 57.5 " 66.5
Tennessee.....	" 12 " 15	" 6 " 7	" 74.3 " 78.6	" 60.1 " 68.7
Lower lake region.....	" 10 " 15	" 3 " 11	" 64.7 " 78.4	" 54.9 " 58.8
Upper lake region.....	" 10 " 20	" 1 " 9	" 69.7 " 75.0	" 49.6 " 58.4
Extreme northwest.....	" 12 " 17	" 4 " 15	" 69.3 " 82.6	" 52.2 " 55.9
Upper Mississippi valley.....	" 9 " 10	" 3 " 6	" 67.7 " 75.2	" 57.9 " 71.2
Missouri valley.....	" 13 " 17	" 2 " 6	" 69.2 " 77.0	" 57.3 " 69.0
Northern slope.....	" 4 " 15	" 2 " 7	" 43.0 " 74.2	" 35.8 " 62.2
Middle slope.....	" 0 " 12	" 0 " 5	" 43.4 " 68.0	" 47.0 " 64.2
Southern slope.....	" 3 " 7	" 1 " 3	" 50.4 " 58.6	" 54.4 " 67.7
Southern plateau.....	" 2 " 15	" 0 " 4	" 31.6 " 53.7	" 45.9 " 52.3
Northern plateau.....	" 2 " 11	" 1 " 10	" 54.8 " 59.3	" 40.4 " 53.5
North Pacific coast region.....	" 2 " 14	" 7 " 14	" 63.0 " 84.9	" 49.5 " 53.4
Middle Pacific coast region.....	" 0 " 10	" 0 " 5	" 38.8 " 87.1	" 48.0 " 55.5
South Pacific coast region.....	" 0 " 2	" 0 " 0	" 43.2 " 78.2	" 59.5 " 61.7
Mt. Washington, N. H.....	Twenty-two	Seven	91.3	43.9
Pike's Peak, Colo.....	Six	One	64.7	28.2
Salt Lake City, Utah.....	Two	None	29.6	37.4

\* Relative humidity corrected for altitude

## COTTON REGION REPORTS.

In the table below are shown the average precipitation and the means of the maximum and minimum temperatures for July 1884, with the July averages for the two preceding years, in the cotton districts. A comparison of these averages shows an excessive precipitation in all of the districts except for New Orleans and Vicksburg, and Galveston, where there were marked deficiencies. No decided changes are shown in the temperature, which was generally above the average.

*Temperature and rainfall data for the cotton districts, July.*

Districts.	Rainfall.			Temperature.						Extremes for July, 1884.	
	Average for July of two preceding years.	Average for July, 1884.	Departures.	Maximum.			Minimum.				
				Mean for July of two preceding years.	Mean for July, 1884.	Departures.	Mean for July of two preceding years.	Mean for July, 1884.	Departures.		
New Orleans.....	5.86	1.62	+ 4.15	91.8	95.3	+ 3.5	72.9	74.9	+ 2.0	106	62
Savannah.....	4.81	5.38	+ 0.57	93.3	91.9	- 1.4	71.5	72.2	+ 0.7	103	56
Charleston.....	5.84	7.15	+ 1.32	92.8	91.7	- 1.1	70.0	72.2	+ 2.2	98	50
Atlanta.....	3.34	4.38	+ 1.04	90.6	90.1	- 0.5	68.5	69.1	+ 0.6	104	47
Wilmington.....	4.03	6.01	+ 1.98	91.7	89.9	- 1.8	69.0	68.8	+ 0.2	101	59
Memphis.....	4.72	4.86	+ 0.14	89.7	90.4	+ 0.7	67.7	69.1	+ 1.4	103	56
Galveston.....	2.94	0.23	- 2.71	94.0	97.6	+ 3.6	72.5	73.8	+ 1.3	107	52
Vicksburg.....	6.89	3.86	- 3.03	90.8	94.0	+ 3.2	70.6	72.9	+ 2.3	102	53
Montgomery.....	3.41	5.52	+ 2.11	92.0	91.9	- 0.1	68.4	69.4	+ 1.0	101	54
Augusta.....	3.43	3.66	+ 0.23	92.2	92.6	+ 0.4	71.0	69.7	- 1.3	106	52
Little Rock.....	2.73	2.80	+ 0.07	91.7	94.7	+ 3.0	68.4	70.0	+ 5.2	104	51
Mobile.....	2.71	5.14	+ 2.43	94.0	93.7	- 0.3	69.8	72.3	+ 2.5	104	51

## WINDS.

The most frequent directions of the winds during the month of July, 1884, are shown on chart ii. by arrows flying with the wind. In the Gulf states, Ohio valley, lower lake region, and in the Atlantic coast districts the most frequent directions were from south to west; in the extreme northwest and upper Mississippi valley they were northerly; in the Missouri valley, middle, and southern slopes they were from southeast and south; in the northern slope, western plateau districts, and on the Pacific coast they were variable.

## TOTAL MOVEMENTS OF THE AIR.

[In miles.]

In the following table are given the stations reporting the largest and smallest total movements of the air in each of the various districts:

Districts.	Stations reporting largest.	Miles.	Stations reporting smallest.	Miles.
New England.....	Block Island, R. I.....	9,424	Eastport, Maine.....	4,191
Middle Atlantic states.....	Del. Breakwater, Del.....	10,542	Lynchburg, Va.....	2,174
South Atlantic states.....	Kitty Hawk, N. C.....	10,064	Augusta, Ga.....	2,493
Florida peninsula.....	Cedar Keys.....	6,311	Key West.....	5,491
Eastern Gulf states.....	Pensacola, Fla.....	5,218	Montgomery, Ala.....	3,372
Western Gulf states.....	Indianola, Tex.....	3,798	Fort Smith, Ark.....	2,650
Rio Grande valley.....	Rio Grande City, Tex.....	7,780	Brownsville, Tex.....	7,307
Tennessee.....	Knoxville.....	3,520	Nashville.....	3,294
Ohio valley.....	Columbus, Ohio.....	4,358	Indianapolis, Ind.....	3,390
Lower lake region.....	Sandusky, Ohio.....	7,848	Toledo, Ohio.....	3,729
Upper lake region.....	Duluth, Minn.....	6,440	Chicago, Ill.....	4,203
Extreme northwest.....	Fort Totten, Dakota.....	7,974	Moorhead, Minn.....	4,723
Upper Mississippi valley.....	Saint Louis, Mo.....	7,151	Dubuque, Iowa.....	3,693
Missouri valley.....	Fort Bennett, Dak.....	5,752	Leavenworth, Kans.....	3,323
Northern slope.....	Cheyenne, Wyo.....	8,135	Deadwood, Dak.....	3,642
Middle slope.....	Dodge City, Kan.....	9,795	Denver, Colo.....	5,673
Southern slope.....	Fort Stockton, Tex.....	7,669	Fort Davis, Tex.....	4,211
Southern plateau.....	Fort Apache, Ariz.....	4,719	El Paso, Tex.....	2,281
Middle plateau.....	Salt Lake City, Utah.....	4,023		
Northern plateau.....	Dayton, Wash. T.....	4,334	Lewiston, Idaho.....	1,268
North Pacific coast region.....	Fort Canby, Wash. T.....	4,339	Olympia, Wash. T.....	1,898
Middle Pacific coast region.....	Cape Mendocino, Cal.....	10,385	Red Bluff, Cal.....	4,134
South Pacific coast region.....	Yuma, Ariz.....	4,329	Los Angeles, Cal.....	3,164

On the summits of Mount Washington, New Hampshire, and Pike's Peak, Colorado, the total movements of the air were 25,815 and 12,834 miles, respectively.

## HIGH WINDS.

On the summit of Mount Washington, New Hampshire, maximum velocities of fifty miles or more per hour occurred as follows: 56, se., 4th; 60, se., 5th; 70, sw., 6th; 64, sw., 7th; 64, nw., 9th; 84, nw., 10th; 60, w., 12th; 59, w., 13th; 87, nw., 14th; 84, nw., 15th; 70, nw., 16th; 70, nw., 17th; 52, nw., 19th; 56, w., 20th; 85 nw., 21st; 84, nw., 22d; 81, w., 23d; 96, nw., 24th, (maximum); 50, nw., 25th; 71, sw., 31st.

The following high velocities were reported from Pike's Peak, Colorado: 50, w., 4th; 56, w., 6th; 50, sw., 7th; 58, sw., 8th; 64, w., 14th, (maximum); 50, w., 16th; 58, w., 22d; 52, w., 29th.

Other stations reporting velocities of fifty miles or more per hour are as follows:

Fort Maginnis, Montana, 52, nw., 31st.  
 Fort Assinaboine, Montana, 53, e., 19th.  
 Fort Benton, Montana, 50, sw., 3d.  
 Cairo, Illinois, 50, ne., 25th.  
 Dodge City, Kansas, 56, ne., 9th; 50, ne., 26th.  
 La Crosse, Wisconsin, 63, n., 25th.

## LOCAL STORMS.

**Arkansas.**—Fort Smith: between 8 and 9 p. m. of the 27th a tornado passed in a southeasterly direction over portions of the Cherokee and Choctaw reservations, in the Indian Territory, crossing the Arkansas line about fifteen miles south of Fort Smith. The corn and cotton crops in the southern part of this (Sebastian) county were badly damaged by the hail, which was of unusual size, and covered the ground in some places to a depth of ten inches. The noise from the tornado cloud was distinctly heard during its passage. Only a light shower of rain and hail fell at Fort Smith.

**Colorado.**—Pike's Peak: a severe storm occurred at Colorado Springs on the 9th. Several houses at that place and in Manitou were flooded by the heavy rainfall.

Cañon City, Fremont county: during the night of June 30—